Price Indexing Methodology and Analysis of the Consumer Expenditure Survey

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Introduction

- Our goal is to calculate consumption shares (weights) and price indexes for different demographics.
- First, we group households by different demographic characteristics.
- Second, we calculate the consumption weights for each group.
- Third, we calculate the Laspeyres index for each group.
- Fourth, we explore the results.

Grouping

- We group the households by characteristics that are available in the data.
- Current groups include:
  - Nationality: Jewish, Arab, Other
  - Religious Observance: Secular, Conservative, Religious, Ultra-Orthodox, Mixed, Other
  - Age group of HHH: Young (18-25), Middle (26-64), Old (65+)
  - Income deciles or quintiles
  - Socioeconomic status of locality: quintiles or tertiles
  - Family size: No children, 1 to 3, 4 or more

Household and Individual Data

- Household-level data includes most of the demographic characteristics we need for grouping.

misparmb	**decile**	**...**	**nationality**
57090	7	...	Jewish
57091	1	...	Arab
57092	3	...	Other

- Individual-level data gives us the age.

S_Seker	MisparMB	Prat	Weight	Y_Kirva	Y_Kalkali	...
2022	57089	1	411.796	1	1	
2022	57090	1	213.598	1	1	
2022	57090	2	213.598	2	2	

Household and Individual Data

- After grouping, we get a table with indicators per household ID (misparmb)

misparmb	Nationality	Age_Group	...	Family_Size
57089	Jewish	Old		no children
57090	Jewish	Old		no children
57091	Jewish	Middle		1 to 3
57092	Jewish	Middle		1 to 3
57093	Arab	Middle		no children

Weights and Laspeyres Index

- The goal now is to calculate the weights and Laspeyres index for each group. For good j, at time t:

$$I_{tj} = \frac{P_{tj}}{P_{oj}}$$

$$W_{oj} = \frac{P_{oj} Q_{oj}}{\sum_{j \in L} P_{oj} Q_{oj}}$$

$$I_t = \sum_{j \in L} W_{oj} I_{tj} \times 100$$

- I_t - Index for period t
- Q_{oj} - Quantity of the good or service in the base period
- P_{oj} - Price of the good or service in the base period
- P_{tj} - Price of the good or service in period t
- L - The set of all goods and services in the index basket

Expenditure Data

- Expenses data gives us the total expenditure on each product for each household. This is useful for calculating the weights. When looking at the base year: $Schum_{oj} = P_{oj}Q_{oj}$

misparmb	prodcode	schum
57089	304170	5357.0
57089	304139	5160.0
57089	381012	723.0
57089	304014	4634.0
57089	304303	1259.0

Survey Data

- Survey data lets us estimate the price paid per unit of product. The variable *mehir* represents the total expenditure on the product, as reported in the survey. *kamut* represents the quantity of the product purchased.
- Using these variables, we can divide *mehir* by *kamut* to get the price paid per unit.

misparmb	prodcode	kamut	mehir
57089	304170	1.0	18.0
57089	304139	2.0	4.0
57089	381012	1.0	44.0
57089	304014	1.0	6.0
57089	304303	18.0	18.0

- We can then calculate the price index for each product j by dividing the current price by the base price: $I_{tj} = \frac{P_{tj}}{P_{oj}}$

Weights and Prices

- We get the following table, per year, per group:

prodecode	weight	price	price_base	price_ratio
300012	0.00024	6.21223	5.41153	1.14796
300038	0.00055	7.54942	6.92654	1.08993
300046	0.00173	13.10342	11.10066	1.18042
300053	0.00087	9.57874	7.63743	1.25418
300061	0.00151	6.25478	3.28928	1.90156

Laspeyres Index

- We can then calculate the Laspeyres index for each group, by multiplying the weights by the price ratio and summing the results: $I_t = \sum_{j \in L} W_{oj} I_{tj} \times 100$

year	Secular	Conservative	Religious	Ultra-Orthodox
2015	100.0	100.0	100.0	100.0
2016	93.810	110.314	179.672	107.349
2017	98.875	102.746	110.247	102.271
2018	96.980	106.899	115.896	105.129
2019	102.574	108.910	121.337	103.093
2020	104.316	119.343	109.186	107.523
2021	107.229	115.962	107.235	114.162
2022	117.634	123.351	124.757	117.745

- Further exploration and analysis of the data is shown separately.

Overview

- In the following slides we take a look at the main variables available in the data
- The Consumer Expenditure Survey provides rich data for analyzing group-level inflation
- Contains detailed information on:
  - Household characteristics
  - Individual characteristics
  - Income sources
  - Expenditure patterns

Key Household Variables

- Number of individuals and providers in the household (HH)
- Nationality of the HH head (Jewish, Arab, Other)
- Locality, socioeconomic status, peripherality index
- Possession of durable goods (e.g. cars, computers) and access to services (e.g. internet, cable TV, central heating)
- Housing characteristics (e.g. ownership, number of rooms)
- Income and income sources (e.g. salary, self-employment, investments, benefits)
- Expenditure patterns (e.g. food, housing, transportation)
- Education type and level of the HH head
- Religion and religious observance level

Key Individual Variables

- Age group (4-year intervals)
- Marital status and marriage year
- Immigrated from USSR
- Immigration year
- Continent of birth of each parent
- Education level, school type, last certification type, years of schooling
- Employment status, occupation, industry, work hours, work weeks
- Various disablity indicators
- Detailed income sources, including investments and benefits

Expenditure Data

- Date of purchase, quantity, prices, estimated monthly expenditure per product
- Packaging type
- Retailer type
- Taxes and transfers
- Savings and investments

Expenditure Data

- Food (bread and cereals, oils, meat and poultry, fish, dairy and eggs, sugar and related products, soft drinks, alcohol, meals outside home, fruits and vegetables)
- Housing expenses (water, electricity, gas, maintenance, housekeeping and cleaning, furniture, appliances, beddings and towels, local taxes, repairs, decorations)
- Clothing and footwear (clothing, footwear, cleaning, accessories)
- Health (medications, medical services, dental services, health insurance)
- Education and entertainment (education services, newspapers, books, cultural events, sports, hobbies, vacations, electronics)
- Transportation (public transportation, private transportation, fuel, maintenance, insurance, flights, mail and delivery, telecommunications)
- Other expenses (tobacco, cosmetics, law services, jewelry, baggage, charity)

Group Analysis Possibilities

Can analyze inflation differences by:

- Income levels (deciles)
- Socioeconomic status of locality
- Religion and religious observance level
- Education level
- Employment status
- Age group

Methodological Considerations

- Sample weights available
- Detailed consumption categories
- Multiple income sources
- Rich demographic information

Limitations and Considerations

- Cross-sectional nature of data
- Need to account for household composition
- Regional price variations
- Sampling methodology
- Response quality